Reply and explanation of the differences to the Official Action summary

The main difference of present invention and prior arts of Owen et al. US 6028635 and Wee et al. US 6697061: This invention is in video "DeCompression" mainly for reducing the computing times of "VLD" + "Inverse DCT", while, the two prior arts of Owen et al. US 6028635 and Wee et al. US 6697061 both are in "Video Compression" and focusing on reducing times of accessing the reference memory frame buffer (US 6028635) and reducing the computing times of "Motion Estimation and/or DCT" (US 6697061) as listed in the table below.

	Sung et al. Present invention	Owen et al. US 6028635	Wee et al. US 6697061
Main features / Key points	Reducing computing times of **"VLD"** + **"Inverse DCT"** which is a set of block compression	Reducing time of saving frame to memory buffer by **"Re-compressing"** the decompressed pixels of reference frame buffer	Reducing computing times of "Motion Estimation" for "Video Editing" which related to video compression

"Claim 1" recites a method for **decoding a video stream:**

1). Decompressing the video stream (VLD + inverse DCT + DeQuantization) and

keeping the DCT bit stream into a temporary buffer for comparing to the new coming

Block stream.

2). Incoming video stream equals to one of previously saved "Block" (DCT

coefficient with VLC coded form) stream, then, the decompressed pixel values

(differential values of a block pixels) will be used to represent the coming block.

We directly compare the video stream block by block to previous stream to identify

the block which equals to previous block which needs no decompression procedure

including ("VLD", "inverse DCT" and "DeQuantization").

In contrast, the cited art of Owen et al. US 6028635. as cited in column 7, Lines 54 to

Column 8 Line 6 Column 8 Line 59 to Column 9 Line 5 performs "DCT

transform ...." Plus **"Re-compressing" the decompressed pixels** before storing

the frame buffer memory and saves time of storing and accessing the referencing

frame. Which does not relate to this invention of inverse DCT and VLD and saving

the decompressed pixels to **an on-chip temporary buffer** for future block pixels

comparison. This invention and Claim 1 does not teach "Re-Compressing" the

decompressed pixels. And this claim does not teach "Re-compressing" for saving

bandwidth of memory accessing. And in Wee 6,697,061 which indeed teaches motion

estimation/compensation and DCT and inverse DCT (Column 4, Line 31-36 and

Column 3, Line 47-55). But, the inverse DCT is for "Reconstructing" the compressed

image as "Referencing Frame" for future Compression used or to identify image

which does not have any editing in previous frame which does not teach this invention

of "decoding video stream" and does not teach VLD, dequantization and inverse DCT

for decompressing a vide stream.

Applicant believes Claim 1 in the present invention needs to make clearer and needs

to **add "On-chip temporary buffer for comparing"** to make more obvious

difference to prior arts to avoid ambiguity.

Therefore, the Applicant respectfully submits you allow Claim 1, with the following

updated Claim:

Claim 1: A method for decoding a video stream, comprising:

saving the coming block of compressed video to the first on-chip

temporary storage device, applying the variable length decoding method to

decode the video bit stream and block by block recovering the DCT coefficients

and dequantizing the coefficient by multiplying the quantization table and

inverse transforming the DCT coefficients to matrix of pixel values;

saving the decompressed block of pixels into the second on-chip

temporary storage device;

looking up incoming compressed block of pixel data to the blocks of received

pixel data saved in the first temporary storage device and identifying whether

any of the previous block is equivalent to the coming block; and

if a "Match" happens:

utilizing the block pixel data saved in the second temporary storage device

corresponding to the matched block of bit stream to represent the block of

decompressed bit stream,

otherwise, decompressing the block of bit stream according to the normal

decompression procedure.

Therefore, the <u>Applicant respectfully submits you allow Claim 1.</u>

Claim 2: The present claim 2 teaches that only the block which does not find an

equivalent block in previous blocks will go through the procedure of video

decompression including VLD, dequantization, inverse DCT to reconstruct the block

of pixels which is different from the quoted prior Owen et al. US 6028635. column 7,

Lines 54-60 which teaches a typical procedure of block decompression no matter it

find or not find an equivalent block of previous blocks. In Owen et al. US 6028635.

column 8, Lines 22-25, Lines 39-41 and Line 59 to Column Line 5) recite the

decompressing the block pixels and **"Re-compressing"** the block before saving the

reference block of pixels into the frame buffer to save the time of saving to memory

which does not have any similarity to this claim.

Therefore, the Applicant respectfully submits you allow Claim 2, with the following updated Claim:

Claim 2:   The method of claim 1, further comprising the steps of decoding the DCT bit stream and saving the decoded result **of block of pixels** into the second temporary storage device and saving the DCT coefficients into the first temporary storage device if the compressed block data fails to match any of the previous blocks.

Claim 3: The present claim 3 teaches that only the block which does not find an equivalent block in previous blocks will go through the procedure of video decompression including VLD, dequantization, inverse DCT to reconstruct the block of pixels which is different from the quoted prior Owen et al. US 6028635. column 8 Line 59 to Column 9 Line 5 recites the decompressing the block pixels and **"Re-compressing"** the block before saving the reference block of pixels into the frame buffer to save the time of saving to memory which does not have any relationship with this claim.

Therefore, the Applicant respectfully submits you allow Claim 2, with the following updated Claim:

Claim 3:   The method of claim 2, further comprising the step of saving the

decompressed result of DCT bit stream into an on-chip second temporary buffer.

Claim 4: The present claim teaches that only the coming block of DCT coefficients

finds an equivalent block in previous blocks will go through the procedure of video

decompression including VLD, dequantization, inverse DCT to reconstruct the block

of pixels which is different from the quoted prior arts quoted in Owen et al. US

6028635 or **Wee et al. US 6697061** teaches the saving of times of compressing the

block pixels in motion estimation by comparing the motion vector of previous blocks

for saving time of compression specifically in motion estimation which consumes

most power of calculation as recited in Column 5 Lines 30-33.

Therefore, the Applicant respectfully submits you allow Claim 4, with the following

updated Claim:

Claim 4:   The method of claim 1, wherein the **coming** DCT input bit stream and

one of the previous blocks of DCT coefficients are identical, then, the decoded block

of pixels is used to represent the coming block.

Claim 5: The present claim teaches that if a tolerance of DCT coefficients of the

block of pixels is set to allow some mismatch and saves time in decompressing the

block data. Which is different from the quoted prior arts quoted in Owen et al. US

6028635 or **Wee et al. US 6697061** which teaches the saving of times of compressing

the block pixels in motion estimation by comparing the motion vector of previous

blocks for saving time of compression specifically in motion estimation which

consumes most power of calculation as recited in Column 8 Lines 26-33 which

discloses a method of compressing video with previously edited or **not edited** for

reducing the computing times of motion estimation which does not relate t this claim

which is focusing on the decompressing a block of DCT data is quite different from

compressing which we do NOT relate to the prior art motion estimation or

compression method.

Therefore, the Applicant respectfully submits you allow Claim 5, with the following

updated Claim:

Claim 5:   The method of claim 1, wherein the DCT input bit stream and the

DCT reference bit stream are matched if a difference of the DCT input bit stream and

the DCT reference bit stream is lower then a predetermined **tolerance.**

Claim 6: The present claim teaches that a neighboring block of pixels is equivalent to

the target block. Which is different from the quoted prior arts quoted in Owen et al.

US 6028635 or **Wee et al. US 6697061** which teaches again, the saving of times of

compressing the block pixels in motion estimation by comparing the motion vector of

previous blocks for saving time of calculation, specifically in motion estimation

which consumes most power of calculation as recited in Column 5 Lines 30-33 which

discloses a method of compressing video with previously edited or **not edited** for

reducing the computing times of motion estimation which does not relate t this claim

which is focusing on the decompressing a block of DCT data is quite different from

the prior art motion estimation or video compression method.

Therefore, the Applicant respectfully submits you allow Claim 6, with the following

updated Claim:

Claim 6:   The method of claim 1, further comprising a step of representing a

target block with a decompressed block pixels' within neighboring blocks if a

compressed stream of the previously saved block in the first temporary storage device

is identical to a target block stream.

Claim 7: The present claim teaches that a block difference is compared to the

weighted difference of a neighboring block of pixels to determine whether it can be

classified as a match. Which is different from the quoted prior arts quoted in Owen et

al. US 6028635 or **Wee et al. US 6697061** which teaches again, the saving of times of

compressing the block pixels in motion estimation by comparing the motion vector of

previous blocks to see whether a match happened or not for saving time of calculation,

specifically in motion estimation which consumes most power of calculation as recited in Column 2 Lines 25-28 which discloses a method of compressing video with previously edited or **not edited** for reducing the computing times of motion estimation which does not relate t this claim which is focusing on the decompressing a block of DCT data.

Therefore, the Applicant respectfully submits you allow Claim 7.

Claim 8: The present claim teaches that a weighted block difference between the target block and a neighboring block is within tolerance to determine whether it can be classified as a match. Which is different from the quoted prior arts quoted in Owen et al. US 6028635 or **Wee et al. US 6697061** which teaches again, the saving of times of compressing the block pixels in motion estimation and the Examiner really teaches some sense in saving times of block video compression specifically in motion estimation only, but does not teach any idea in **decompressing** a video block of bit stream.

Therefore, the Applicant respectfully submits you allow Claim 8.

Claim 9: The present claim teaches that a weighted block difference between the target block and a previously decompressed block is within the tolerance to determine

whether it can be classified as a match and using the decompressed data of the matched block to represent the target block. Which is different from the quoted prior arts quoted in Owen et al. US 6028635 or **Wee et al. US 6697061** which teaches again, the saving of times of compressing the block pixels in motion estimation in saving times of block video compression specifically in motion estimation only, but does not teach any idea in **decompressing** a video block of bit stream.

Therefore, the Applicant respectfully submits you allow Claim 9.

Claim 10: Applicant agrees at canceling this claim.

Claim 11: The present claim teaches that the decompressed block is compressed again before storing to the on-chip temporary buffer. Which is different from the quoted prior arts quoted in Owen et al. US 6028635 Column 8, Line 59 to Column 5 which re-compresses the decompressed block of data and storing to a DRAM off-chip memory buffer to save the time of accessing. **Wee et al. US 6697061** which teaches again, the saving of times of compressing the block pixels in motion estimation in saving times of block video compression specifically in motion estimation only, but does not teach any idea in **recompressing** a video block of bit stream.

Therefore, the Applicant respectfully submits you allow Claim 11, with the following

updated Claim:

Claim 11. The method of claim 1, wherein **a block of** decompressed bit stream is compressed before **being stored to the second temporary storage** buffer for future representing new block stream.

Claim 12: the decompressed block is compressed again by a lossless compression algorithm before storing to the on-chip temporary buffer. This method which will not create error or will not propagate the error to other frames, and is different from the quoted prior arts quoted in Owen et al. US 6028635 or **Wee et al. US 6697061** which teaches again, the saving of times of compressing the block pixels in motion estimation in saving times of block video compression specifically in motion estimation only, but does not teach any idea in **recompressing** a video block of bit stream. What the Examiner think is not an **obvious perspective** since most people only know the lossy algorithms. Even those few people do not necessary understand the value of applying a lossless compression algorithm to help further reducing the cost and die size of the on-chip secondary temporary buffer.

Therefore, the Applicant respectfully submits you allow Claim 12, with the following updated Claim:

Claim 12: The method of claim 1, wherein a block of decompressed bit stream is

compressed through a lossless compression mechanism before being stored to an

on-chip secondary temporary buffer and is decompressed for future representing a

new block stream.

Claim 16 recites an apparatus of this invention of efficient video bit stream decoding

including three units: one to store the coming video stream and the decompressed

previous stream of at least one block of pixels, another unit compares the new video

stream to one of the previously decoded streams, and a selector choose the matched

block of pixels to represent the new block.

In contrast, Owen et al. US 6028635 teaches only the popular apparatus of realizing

the video decompression (Column 7, Line 54 to Column 8 Line 6)

In Column 8, Line 59 to Column 9 Line 5 teaches only "Re-compressing" the

decompressed block before storing the an off-chip DRAM memory. **Wee et al. US**

6697061 teaches mainly the video editing in saving times of motion estimation and does not

teach the video stream decoding at all (especially it focuses on line 34-38 of "Video

Editing" and distributing). In Column 4 line 31-36 teaches only saving of searching

times in motion estimation, not video stream decoding as this invention of video

decompression.

Applicant believes Claim 16 in the present invention needs to make clearer and needs

a minor change to avoid ambiguity. Therefore, applicant respectfully submits you

allow Claim 16, with the following updated Claim:

Claim 16:   An apparatus for decoding a video stream, comprising:

a bit stream decoding unit including a VLD, variable length deciding and

reconstructing the video bit stream to DCT matrix and a DeQuantization unit

multiplying the DCT matrix to inverse transforming and recovering the block of pixel

matrix;

the first on-chip storage device for storing compressed video data stream and the

second on-chip storage device for storing the corresponding decompressed pixel data

of at least one previous block ;

a device comparing a coming compressed stream to at least

one previously saved stream; and

a device of selecting one of previously saved decoded blocks of pixel matrix to
represent a target block if a target block is identical to one of the previously saved
blocks.

Therefore, the Applicant respectfully submits you allow Claim 16.

Claim 17: The present claim teaches that the comparator used to decide whether a

block match is found in previous blocks is used to select the matched block as the

target block. Which is different from the quoted prior art quoted in **Wee et al. US**

6697061 (Column 5 line 11-32, and Column 8 line 58-65) which teach again, the

saving of times of compressing the block pixels in motion estimation in saving times

of block video compression specifically in motion estimation only, but does not teach

any idea in **comparing the block and selecting the result of a previous block to**

represent the targeted video block of bit stream.

Therefore, the Applicant respectfully submits you allow Claim 17, with the following

updated Claim:

Claim 17. The apparatus of claim 16, wherein an output of a comparator is used to

select the decoded pixels stored in the on-chip second temporary buffer to represent

the target block pixels.

Claim 18: The present claim teaches that the matched block in previous blocks is

copied to represent the target block. Which is different from the quoted prior art

quoted in **Wee et al. US 6697061** (Column 5 line 27-33) which teaches again, the

saving of times of compressing the block pixels in motion estimation by saving times

of calculating the motion vectors in saving times of block video compression

specifically in motion vectors only.

Therefore, the Applicant respectfully submits you allow Claim 18.

Claim 20 recites an apparatus of this invention of efficient I-type video frame bit

stream or a still image JPEG image decoding. Neither Owen et al. US 6028635 nor

Wee et al. US 6697061 teaches how the still image or I-type frame of a video stream

leverages previous block of data for decompressing the intra-coded block of data. In **Wee et**

al. US 6697061 Column 7, Lines 10 -27 indeed teaches I-, P- and B-type frames. But,

only teaches the saving of searching times in motion estimation, not video stream

decoding as this invention of video decompression.

Therefore, the Applicant respectfully submits you allow Claim 20, with the following

updated Claim:

Claim 20. The apparatus of claim 16, wherein in decompressing an I-type frame or a

JPEG still picture, one of previously decoded and saved blocks is selected to represent

the target block.